



de Aguiar, T. R.S. and Paterson, A. S. (2017) Sustainability on campus: knowledge creation through social and environmental reporting. *Studies in Higher Education*, (doi:10.1080/03075079.2017.1289506).

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Sustainability on Campus: Knowledge Creation through Social and Environmental Reporting

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Abstract:

This study contributes to the debate on sustainability in higher education through a project conducted in a single Scottish university that incorporated sustainability into undergraduate accounting education through the application of a real-world problem in the form of a social and environmental report (SER). Data from study participants was collected through questionnaires, which were analysed and interpreted through the lens of knowledge creation. The results demonstrate an increase in awareness and positive response to sustainability issues from all parties. It further indicates that opportunities to shape and develop further sustainability initiatives are possible through a dialogical approach. Such an approach is shown to provide an opportunity for knowledge creation and the transfer of sustainability issues in a democratic and emancipatory way. It highlights the importance of developing spaces/opportunities for sustainability dialogue that not only transcend the boundaries of a specific graduate discipline but also the borders of higher education institutions.

Keywords: Sustainability; Knowledge Creation; Higher Education; Social and Environmental Reporting

Introduction

Providing students with a real-world experience is considered an important approach for teaching and learning on sustainability issues (QAA 2014). Indeed, education is widely recognised as being the most powerful means of promoting sustainability, with university education considered to be a significant influence in advancing developments in sustainability as many graduates go on to hold leading organisational and governmental positions (Del Mar Alonso-Almeida et al. 2015). In this paper, we consider how undergraduate accounting education can respond to the call to incorporate real-world experiences and sustainability into the curriculum. Our study reports on a teaching and learning experience, which involved second year undergraduate accounting students at a single Scottish university in the production of a social and environmental report (henceforth SER) for their campus. The construction of the SER required students to engage in a dialogue on sustainability issues with individuals both internal and external to the organization.

This paper contributes to educational literature in two different but complementary ways. First, it explores SER as a practical tool for teaching and learning. More specifically, it analyses how students and members of staff perceived the benefits of being involved in the production of a SER. These impacts are analysed not only in terms of the different types of skills that students might develop while producing the report, but also in terms of how sustainability disclosures can contribute to improvements in sustainability practices within the university campus. Second, this paper contributes to the dialogical approach to SER by considering how the project promoted a space for formalizing knowledge through experiences and setting a dialogue. Nonaka and Konno (1998) put forward the idea that a shared space in which individuals have opportunities to establish relationships and engage in

dialogue on real-world issues can create and disseminate new knowledge. The importance of this analysis lies in the fact that a practical experience of a dialogue in a specific space may tell us about the abilities of participants and the difficulties they encounter during the different stages/forms of communication. We use the theory of knowledge creation to identify the possible strengths and failures of a dialogical approach when it is used to promote change in an organizational context. Building upon these strengths and failures creates an opportunity to shape and develop further initiatives based on the dialogical approach, and provides space for knowledge creation and transfer of sustainability issues in a democratic and emancipatory way.

Grounded in prior research, this paper begins with an outline of the main educational concerns of sustainability in higher education. We then explore the dialogical approach to SER as an emancipatory instrument for accounting education while promoting organizational changes. The theory of knowledge creation is put forward as a means of analysing how the SER project can create knowledge and then transfer it between different parties, both internally and externally, through a dialogical approach. The research methods and context of the study are then laid out. This is followed by the empirical results and analysis. Finally, we present our reflections and final comments.

Sustainability in Higher Education

The concluding round table session of the 4th UNESCO Higher Education for Sustainable Development Conference (HESD) in 2011 featured the three perspectives of ‘community’, ‘curriculum’ and ‘campus’ to support understanding of the contribution of higher education to sustainability (Müller-Christ et al. 2014). Three key messages came out of the debate. First, given the role that they play in research and development, universities should work towards improving the quality of their interactions with external parties and increase their engagement in addressing real-world issues that affect local communities and society in general. Second, more consideration should be given to viewing students as co-creators of knowledge and agents of change (Maxwell-Stuart et al. 2017). Attention should be focused on engaging students in solving real-world problems that not only enable mastery of their own discipline but also facilitate knowledge creation through a problem-orientated approach that encourages collaboration and consideration of the interdisciplinary and transdisciplinary contexts of sustainability. Consistent with this view, the QAA (2014) indicates that education should not only provide students with knowledge of their subject, but also prepare and encourage them to consider economic, social and environmental wellbeing (pillars of sustainability) into their personal and professional lives. Third, innovation and knowledge creation with respect to sustainability developments should be stimulated by linking university accountability with campus sustainability (Müller-Christ et al. 2014). However, university education has to a large extent maintained its traditional orientation on Newtonian and Cartesian mental models that standardise learning and action into reductionist thinking and mechanistic paradigms, which are self-controlling and relatively unaffected by outside forces (Elton 2003). Therefore, the process of embedding sustainability and real-world experiences into higher education is challenging.

The literature on sustainability in higher education can be broadly organized into two themes. The first examines the teaching and learning practices related to sustainability issues and

real-world experiences (Cotton et al. 2012, Brundiens et al. 2010). Within this literature, studies have shown that the introduction of sustainability into the higher education curriculum has not been an easy task and that there are still barriers to be overcome (Cox and Ingleby (1997). For example, changes that incorporate sustainability aspects have been driven mainly from the 'top down' or 'bottom up' (Brinkhurst et al. 2011). Top down initiatives happen when the higher levels of university administration are committed to promoting sustainability, while bottom up initiatives originate mainly from students' interest and best practice. Academics who are located in the middle of the organization appear to be largely unable to overcome bureaucratic barriers without substantial support from senior management (Brinkhurst et al. 2011). One potential solution to this problem would be to create a combination of class-based and real-world activities, thereby promoting a more experimental form of learning (Brundiens et al. 2010).

Having considered some of these issues from a teaching and learning perspective, we now turn our attention to the second theme, which concerns sustainability developments within the physical location of the university campus (Lozano 2011, Brodhag 2013). A substantial part of this literature assesses the information produced and published by universities for both internal and public consumption (Godemann et al. 2014, Matthew 2014). This information on sustainability is intended by higher education institutions to be one of the main drivers of changing practice on university campuses (Fonseca et al. 2011). However, while producing sustainability reports seems to provide a good opportunity for universities to communicate their efforts to stakeholders (Lozano 2011), the literature observes that less than 30% of institutions actually provide such reports.

Our research brings these two themes in the literature together by exploring the following three main objectives: first, we evaluate a practical exercise in which a cohort of accounting students produced a SER for their own university; second, we explore the barriers middle-ground academics can face while involved with the previously mentioned activity; third, we apply knowledge creation theory to understand the first and second objectives. In doing so we contribute to the debate on knowledge creation and sustainability awareness within university accounting education. In the next section, we explain how SER can be implemented as an effective and emancipatory pedagogical tool for social and environmental reporting while engaging different stakeholders in dialogue to promote knowledge and organizational change.

Social and environmental reporting and dialogical education

Thomson and Bebbington (2005), posit that the provision of corporate accounts in all their guises can be viewed as a means of educating stakeholders both internal and external to the organization through the communication of events and activities. Taking this view SER can be utilized as a pedagogical tool to investigate events which were previously partly known or little understood. Involving different stakeholders' voices within SER's can be beneficial, but the quality of this polyvocal approach is argued to be influenced by the level of participants' education, which to some extent determines the depth of the dialogue (Bebbington et al. 2007).

Dialogical education is developed to allow a critical perspective of a reality, enabling participants to liberate themselves from the conventional *status quo* (Bebbington et al. 2007).

The dialogical perspective on SER tends to avoid the static approach of conventional accounting, which is focused on financial and short term concerns (Brown and Dillard 2013a, b). For this reason, a dialogical approach to SER is considered to be emancipatory (Brown 2009).

Placing emphasis on dialogue can be an important tool for sharing and capturing knowledge that is not normally included in SER (Bebbington et al. 2007). We support the existence of a particular knowledge, which is specific to each participant. This type of knowledge combines an individual's interpretation of the world and the way participants choose to conduct themselves as well as individual's own experiences in relation to a specific organization (Bebbington et al. 2007). The extent to which individuals share this unique knowledge depends on their level of interaction within the dialogue process (Thomson and Bebbington 2005). As such, the method of stimulating and carrying out the dialogue is also an important factor.

Recognizing that each stakeholder and organization has its own agenda, individuals need to explain clearly what their objectives are in establishing a dialogue and how these objectives can be linked through common interest (Dillard et al. 2005, Gray et al. 2009). Through such dialogue, knowledge creation and transfer can be facilitated within the organization.

Organizational Knowledge Creation Theory and Dialogical Education

Knowledge creation theory highlights the existence of two main types of knowledge: explicit and tacit. Explicit knowledge is that which can be formalized in writing or figures (Nonaka 1991, Nonaka and von Krogh 2009, Nonaka et al. 2006, Nonaka 1994). Tacit knowledge is personal and involves, for example, senses, intuition, and practical experiences. Tacit knowledge is shaped by an individual's own skills, perspectives and beliefs. It is therefore often taken for granted that this knowledge exists, which can render it difficult to explain and articulate (Nonaka 1991, 1994). In this paper, we argue that these two types of knowledge are also part of a dialogical approach to SER and that the quality of SER depends on how these two types of knowledge are integrated. For example, Thomson and Bebbington (2004) highlighted that, in a dialogical approach to SER, different kinds of knowledge are transferred as part of an educational process, which can shape both individual and collective beliefs, principles, and collective standards in society that, from our perspective, can be categorized as explicit knowledge. At the same time, they also highlighted the existence of other types of knowledge that, in our view, could be classed as sub-categories of tacit knowledge, such as a personal understanding of the world and how people choose to conduct themselves.

By examining the interactions between tacit and explicit knowledge, the theory of knowledge creation suggests that there are four modes of knowledge (see Table 1). Nonaka (1994) devised the 'Modal Shift and Spiral of Knowledge' to explain knowledge creation. This model stresses the dangers of concentrating on only some modes of knowledge creation, especially 'socialization' and 'combination'. Nonaka (1994) posited that tacit and explicit knowledge should complement each other in the process of knowledge creation and that, in order to have constant knowledge creation, an organized and sequential process must be

followed, which goes through the four modes in the following order: socialization, externalization, combination and internalization.

Here, we suggest an adjusted interpretation of these modes of knowledge creation in order to include a dialogical approach to SER. In Table 1, we recognize that the four types of knowledge creation complement each other and are part of a continuous dialogue. Moreover, we argue that the process of knowledge creation in a SER context happens through the constant exchange, implementation (putting into practice), experience and internalization (becoming routine) of tacit and explicit knowledge (Nonaka and von Krogh 2009, Nonaka 1994, Szulanski 1996). These steps are similar to those highlighted by Adams and McNicholas (2007) and Contrafatto *et al.* (2015) while implementing research in a SER context.

[Table 1 about here]

From table 1, we can see that organizations reluctant to accept change in a SER context tend not to socialize, but rather to focus on the mode called ‘combination’, in which SER is viewed only as a process of creating explicit knowledge (Reeves 2011). In this situation, the flow of knowledge between tacit and explicit is almost non-existent. Furthermore, organizations which fail to formalize tacit knowledge by producing SER reports also limit the dissemination of change into broader society, reducing the possibility of knowledge exchange and creation (Nonaka 1994).

As a result, tacit knowledge creation is seen to be dependent on specific conditions (Eraut 1985); for example, the need to build a space, or ‘ba’. Another important condition for the dissemination of tacit knowledge is the establishment of a frequent dialogue between members of the ‘ba’ (Nonaka and Konno 1998, Nonaka and Toyama 2003). In this context, face-to-face communication is an effective way to establish a dialogue and is a powerful tool with which to engage members of the field in the development of ideas and concepts (Gorsky *et al.* 2006).

The context of the study and the research methods will be outlined in the next section. This is then followed by the presentation of the empirical data and its analysis using the lens of knowledge creation theory.

Study Context

In response to the call to incorporate a real-world experience and sustainability into the curriculum outlined above, our study engaged 142 second year undergraduate accounting students on a Social and Environmental course at a single Scottish university in the development of a SER for their campus. The students organized themselves into groups of 5 to 10 members, and were free to choose their own group members. The composition of the groups was reasonably well balanced in terms of gender mix.

The course on which the SER project was conducted utilises an experiential approach to teaching and learning in which the provision of a learning environment facilitated by the

educator encourages students to apply existing knowledge and conceptual understanding to a real-world task (Kolb, 1984). The rationale for adopting this approach is based on the conception that engaging students in formal, guided, authentic, real-world experiences encourages them to discover how to deal with real-world problems themselves. Such an approach is argued to deepen knowledge through action and reflection; facilitate skills development through practice and reflection; and support the creation of new understandings when placed in innovative situations which in turn extends knowledge when learning is brought back to the classroom (Kolb, 1984).

With respect to the data required for the construction of the report, the academic project leaders provided students with relevant information from different parts of the university, such as Human Resources, Registry and the Estates department. Students were also directed to relevant information from sources external to the university, such as a report on the benchmarking of UK universities in terms of social and environmental practices¹, as well as information produced by other UK universities on their social and environmental practices². All information gathered was uploaded to the virtual learning environment for ease of access. The students were also free to find and include any other relevant information publicly available that they deemed appropriate and useful for the report. This enabled students, to choose areas of sustainability practice within their own areas of interest and to investigate what the university was doing with respect to these.

All students were provided with a project brief that outlined the task in hand, set the parameters of the project and specific objectives which included the analysis of the aforementioned documents and related financial data. In addition to preparing a final report, each group was required to present its findings and suggest recommendations for campus reporting improvements at the end-of-course workshop the audience of which comprised of the whole student cohort, and a panel of academic, administrative and external stakeholders.

Feedback Data

An objective of university education is to equip individuals with knowledge (understanding, identification and/or description of a subject), skills (ability/competency acquired while put knowledge into practice) and attributes (capacity for independent thinking) that enable them to act towards the wellbeing of this and future generations (QAA 2014). These are relevant considerations that add to students' employability as employers increasingly seek the demonstration of such skills during graduate recruitment rounds (Drayson 2015). Taking this into consideration we sought to evaluate students' perceptions of these skills development and experience of working with a real-world problem through the SER.

Drawing on the work of Brundiers et al. (2010), our questionnaire included a list of 19 different skills under 4 categories (see Table 2). These skills were selected to adapt the concept of the three clusters of key competencies that sustainable development in higher education should pursue (QAA, 2014). These clusters are the following: strategic knowledge (content of a subject, status quo and past developments on the topic), practical knowledge (competence to link concepts/content of a topic to practice) and collaborative knowledge (competence to work in teams). Thus, the questionnaire captured skills developed from different knowledge acquired on these three clusters, as follows: skills on the subject matter

and CSR initiatives in higher education (strategic knowledge), skills on group work (collaborative knowledge) and other skills (practical knowledge).

At the end of the project three types of feedback were gathered to avoid bias and allow triangulation. The feedback was gathered using questionnaires completed by students and the members of the panel audience. The first source of feedback was that collected from students, which was gathered to explore how students perceived the activity (both the construction of the report and the formal presentation) to have contributed to their employability skills development (see Table 2). The second source of feedback was a questionnaire distributed to the members of the panel who were part of the audience while students presented their findings. This questionnaire consisted of four open-ended questions on the panel's perception of the project from a skills development and knowledge creation/sharing perspective. The third type of feedback was a follow-up questionnaire given to the same group of students 2 years after the completion of the project to ascertain any lasting impact of the project on students' professional and personal behavior.

Research Findings

Stage I- Feedback after Finishing the Coursework

Student Perceptions of Skills Development

The first set of data consists of student feedback on completion of the SER project. This data sought to elicit student perceptions of the project to development of skills as laid out in Table 2. A questionnaire was distributed to students at the end of the course. No identifying characters were included on the feedback sheet to ensure anonymity. Completion of the feedback sheet was also voluntary. The level of response to the questionnaire was 61 students, which represented 43% of the students. Perceptions of the project contributions to developing these skills were evaluated using a 5 point Likert scale (Excellent, Very Good, Good, Poor and Very Poor).

The first category is related to how the project contributed to improving students' knowledge of the subject matter. Table 2 shows that most students perceived the relevance of the project for learning about different aspects of the subject matter, such as social and environmental accounting, corporate reporting, corporate social responsibility, environmental and social issues.

[Table 2 about here]

The second category relates to how students perceived the project to have contributed to their knowledge of the university's and other organizations' initiatives regarding corporate social responsibility. The majority of students agreed that the project helped them to learn more about their own university. In addition, most students found the project useful in terms of learning more about other organizations' corporate social responsibility.

The third category refers to students' evaluation of the project as a group activity. Students were very positive about their experience of group work. For example, students perceived the

project to have developed cooperation among the members of the team and fostered a sense of responsibility to organize and attend group meetings. Most students also found the project to be a valuable activity for experiencing brainstorming and learning how to manage conflict resolution and workload distribution.

Finally, the fourth category considers other skills that students may feel they have learned. The students positively evaluated the project in terms of helping them to develop skills in presentation, discussion, research, writing and thinking critically and creatively. The results described above affirm the process of change students went through, which allowed them to develop and implement skills that are desirable for employability purposes.

Feedback from the Panel Audience

Prior studies have indicated that there is a lack of coherence on sustainability among members of faculty (Aktas et al., 2015), to the extent that university stakeholders and academics are not fully aware of what sustainability means and what constitutes sustainability principles (Nejati and Nejati, 2013). This section presents the feedback of the three non-academic members of the panel and one academic not involved in the construction of the project. The questionnaire completed by these participants consisted of four open questions, which explored two main points. The first point considered how the SER project may have contributed to the participant's own personal and professional awareness of sustainability issues. The second point explored the participant's views on the potential value of such an exercise and any suggestions and/or comments that they may have regarding the utilization of this type of teaching and learning activity for sustainability knowledge creation and development.

Responses to the teaching and learning aspects of the SER project reflected positive views. For example, one of the positive points highlighted was the opportunity that the project provided to engage in a dialogue with students on sustainability and environmental issues, reinforcing the relevance of a space ('ba'). Creating a space for discussion was considered beneficial for a participatory process, involving different areas of academic community (e.g. research, teaching and administration). As such, participatory initiatives can be considered to facilitate debate and deeper comprehension on the existent complexities, multi-dimensional and multidisciplinary approach that sustainability requires (Disterheft et al. 2015, Aktas et al. 2015).

The relevance of employing a real-world activity as part of student teaching and learning and the inclusion of academic and external participants in the project were also acknowledged to be positive features. Likewise, the information contained within the social and environmental report were deemed valuable in terms of knowledge transfer, knowledge creation and employability skills development. This confirms the view that incorporating real-world activities into the curriculum can facilitate valuable teaching and learning opportunities and dialogue between academia and practitioners (Brundiars et al. 2010, Brundiars and Wiek 2011).

The SER project was also perceived to have had a positive impact at an administrative level, as it stimulated thought regarding how sustainability and environmental practices across the university could be improved. Additionally, the project was reported to have prompted

individuals to consider the small changes that they could make in their personal daily routine. It was further suggested that the project report and presentations had been educational for the panel audience. This represents knowledge transfer, through which members of the panel identified possible areas of change in their day-to-day actions of which they were previously unaware.

Wright and Wilton (2012), posit that the absence of knowledge is one of the most important barriers to sustainability in higher education. The impact of human factors on organizational change (eg.: the existence of ambassadors for sustainable development) is also identified as essential to overcome resistance during the process of integrating a sustainable development approach in higher education (Verhulst and Lambrechts 2015). The data presented so far thus indicated that this project has proven to be instrumental in the transfer of knowledge among students and members of staff; allowing deeper understanding and dialogue with respect to sustainability.

Stage II –Feedback Two Years after Finishing the Coursework

Student Perceptions of the Impact of SER on Behavioural Change and Knowledge Creation

A follow-up questionnaire was issued to students 2 years after the project. The second questionnaire attracted 27 student respondents; 44% of the number of students that responded to the first questionnaire. The response rate was probably lower due to some of the original study participants having graduated. This questionnaire was designed to elicit student perceptions of any lasting impact of knowledge exchange of SER on their personal and professional behaviour. In general, students acknowledged that the elaboration of SER had an impact on their personal understanding of sustainability and environmental issues and had engaged them in thinking about and discussing such issues both inside and outside of the university environment, which may not have happened otherwise. Approximately 44% of students indicated they had other opportunities to discuss social and environmental issues during their degree, but that these opportunities were mostly related to other courses on their programme of study, which were coordinated by members of staff that were involved in the SEA project. In general, students indicated the importance of having a space ('ba') within their programme of study to discuss social and environmental issues with peers/members of staff.

I believe, as with most issues, that social and environmental issues should be explored for potentially negative impacts on groups and individuals (such as universities, companies and communities). Some issues may not cause noticeable effects immediately but awareness should be created to their nature and future problems. (Student 2)

Engagement with the SER was also reported to have provided a useful point of discussion externally, particularly from an employability aspect.

At a job interview, I discussed it as an example. (Student 22)

I was able to discuss these issues when I was going for a role within the student union. Because of this and my awareness to these relevant issues and how it can affect the university I was successfully offered the role I applied for. (Student 4)

It was further noted that engagement in the SER had, in some circumstances, initiated personal behavioural change.

It made me realize that lights need to be turned off. I now save more electricity, recycle more. (Student 12)

While another indicated

I didn't waste as much paper working notes. (Student 19)

Indeed, approximately 30% of students noted that it increased their awareness of the importance of sustainability and environmental issues and of simple ways in which individuals can make small contributions to reducing waste and carbon emissions.

Yes, through this project I got to understand the importance of recycling and energy saving. I rely more on buses now when commuting to university and I also share-a-car with a friend which again can help to lessen the [university's] carbon footprint. (Student 4)

Thus, evidence of behavioural change extends to knowledge transfer and knowledge exchange beyond the context of the university, enhancing students' environmental awareness and employability skills. This movement beyond the course indicates that it has the potential to influence and generate multiple new knowledge transfer spirals.

In addition to the evidence of behavioural change, there was indication of knowledge creation. Students perceived the four modes of knowledge creation to be related to different stages of project elaboration. It was surprising that most students related more than one project stage to one specific mode of knowledge creation. However, in general students chose the following correspondence (see Graphic 1): Socialization (Presentation), Combination (Report), Externalization (Report) and Internalization (Recommendations and Presentation). This confirms that students perceived the project to be not only an opportunity to present explicit knowledge, but also an opportunity to express their own tacit knowledge.

[Graphic 1 about here]

This result may also indicate that students developed all four modes of knowledge creation, but that some parts of the project were more effective tools than others for promoting different modes. Table 3 shows that students did not perceive all stages of SER as having equal impact on them through engagement/discussions (measured by a 5 point Likert scale). For example, the presentations seem to have had a different impact on students' experience of knowledge, with this activity perceived as a way to share tacit knowledge and as an opportunity to present the explicit knowledge shaped by their own experiences. This result may be relevant when identifying the part that different stages of the project may have on the process of knowledge creation. Thus, providing appropriate incentives for engagement in real-world activities could contribute to developing different modes of knowledge creation, thereby facilitating the achievement of specific results needed by an organization.

[Table 3 about here]

Stage III - Reflections of Academic Project Leaders

The final section presents the views and reflections of three academic staff who were involved in the design and implementation of the SER activity.

The conception of this project arose from discussion on how accounting education could respond to the call by UNESCO (2015) and the QAA (2014), to incorporate a real-world experience and sustainability into the curriculum. The ability to write and analyse reports and to engage in critical thinking are key employability skills within the accounting profession. This led us to consider the application of the student SER project within the discipline of accounting, on the grounds that such a project could potentially offer contributions to sustainability from ‘community’, ‘curriculum’ and ‘campus’ perspectives, as well as facilitating knowledge creation through a dialogical approach.

Reflecting on the feedback provided by both the students and panel audience involved in the project, the SER project appears to have provided an innovative way of delivering the subject matter by engaging students, academic staff and other interested parties in the pursuit of a common goal. The dialogic approach of SER emphasizes opportunities to share not only common, agreed and/or accepted knowledge about the world, but also each individual’s understanding of the context in which they find themselves and how they decide to conduct themselves in this context. Thus, engagement with the SER and the recommendations contained therein may have an emancipatory dimension through which students can liberate themselves by formally articulating their own experiences within a generated space for debating social and environmental issues

The theory of knowledge creation places emphasis on an organized sequence of modes of knowledge creation (Nonaka and Toyama 2003). Taking this into consideration our research reinforces the idea that the process of knowledge creation works as a spiral, constantly turning via creation of a space in which personal knowledge is shared, thereby creating new ideas. A desirable scenario for higher education would be to increase the frequency of spiraling by promoting interactions between accounting students from all year groups and courses.

Another desirable scenario would be the identification of real-world projects as generators of linked spirals of knowledge creation. Interactions with other areas of knowledge in an interdisciplinary manner would also be encouraged. Members of staff from different areas of the university who participated in the panel audience shared the space created by the project and may be able to use the knowledge they acquired to start a spiral of knowledge creation in their own field. The creation of these linked spirals could be very effective by way of engagement in a space in which participants could exchange explicit and tacit knowledge.

The challenge for academics however, is finding a balance between keeping the spirals turning frequently to promote new changes, and amplifying the chain of interrelated spirals of the initially created space. Ideally, the influence of the space would extend beyond the university boundaries when, for example, students start to apply the knowledge acquired in their workplace and/or communities. Such an outcome would satisfy the QAA (2014)

objectives of encouraging economic, social and environmental wellbeing (pillars of sustainability) into students personal and professional lives.

Final Comments

In this paper, we described an educational exercise of which the main focus was the production of SER at a single Scottish university. As a teaching and learning practice, the data indicates the SER project was not only perceived as a good initiative through which to develop awareness of sustainability issues, but it also equipped students with employability skills, such as: working in groups, conflict resolution, presentation and communication skills. Moreover, the SER project provided a space ('ba') for engagement in which students, academics and members of administrative staff engaged in dialogue that facilitated better understanding of the initiatives that the university has in place regarding sustainability.

This paper also provides an analysis of the SER project as being a practical example of a dialogical approach to SER and knowledge creation. Our research demonstrates that the application of these two approaches, when taken together, can contribute to a new visualization of developments within and engagement with the SER agenda in the higher education context. While the study is limited by the sample size, it nevertheless contributes to the debate on sustainability within the university setting and compliments the work of Müller-Christ *et al.*, (2014) and opens up opportunities for further research in this area. It demonstrates that incorporating sustainability through the inclusion of a real-world problem in the curriculum can increase awareness of and responses to sustainability and environmental issues. More specifically, we have demonstrated that explicit and tacit knowledge were shared and created in the sequence of the stages required by the described SER project. Reflecting on this experience, we have determined that a dialogical approach to SER can be achieved by using several modes of knowledge creation in a complementary manner. This study supports the idea that the construction of a SER should involve different stages in order to encourage generation of different modes of knowledge creation, as suggested by Nonaka (1994) in the 'Modal Shift and Spiral of Knowledge'.

Indeed, the reflections presented above signify a visualization of knowledge creation and dissemination, which can help to identify areas (or modes of knowledge creation) in need of improvement. It can also help to map how, where and why space boundaries should be expanded; influencing internal and external environments. In our view, providing the correct incentives at each stage of the construction of the social and environmental report can motivate the development of the modes of knowledge that organizations most need to facilitate sustainability. Selection of these modes can be done strategically depending on the particular objectives and/or perspectives of the individuals involved in the process of knowledge creation.

In the specific experiment described in this paper, knowledge creation was possible because of the establishment of new spaces. Creation of a space that facilitates dialogue on sustainability issues by academic staff can turn into a powerful instrument of change. However, maintaining the conditions necessary to keep the space operating, by spinning spirals of knowledge creation, is a challenge that needs to be explored further in future research. The pursuit of knowledge creation and interaction of organizational members (staff

and students) may help to identify strengths and barriers, as well as plan for future desirable achievements/impacts of sustainability. We strongly encourage future research to explore the conditions that help to maintain the space in which discussions on sustainability issues are carried out in higher education.

ACKNOWLEDGEMENTS

We are very grateful for the comments received by the reviewers of this paper. We appreciate the support received by members of staff and external organizations (due to research procedures we are unable to disclose their names) that contributed to the project. We also would like to express our appreciation to Dr. Bill Jackson and Dr. Akira Yonekura for their useful comments and feedback. Thanks also go to the students who participated in the project. Without their engagement and passion to the subject this article would not exist. We also would like to give our thanks to the Edinburgh Centre for European Financial Studies (EDIFIS) and the QAA Enhancement Theme, who provided small grants to the University Enhancement Group to support this project. An early version of this paper was presented the 2013 International Enhancement Themes Conference organized by the Scottish Higher Education Academy. We very much appreciated the comments received during this event.

Table 1: Adaptation of patterns of knowledge creation to SER development

MODES OF KNOWLEDGE CREATION	DESCRIPTION	RELATION TO SER DEVELOPMENT
SOCIALIZATION	From tacit to tacit knowledge. Individuals learn tacit skills from each other by observation, imitation or practice.	SER is conducted via interactive communication and reflection about the world. The knowledge created within this process is not formalized in SER.
COMBINATION	From explicit to explicit knowledge. Combination of different explicit knowledge to create new knowledge.	SER is produced by putting together different types of explicit knowledge that exist internally or externally to the organization. An illustration of this situation could be production of SER by following guideline requirements.
EXTERNALIZATION	From tacit to explicit knowledge. Individuals are able to formalize their tacit knowledge.	Individuals are able to express their own experiences and interpretation of the world through SER.
INTERNALIZATION	From explicit to tacit knowledge. Individuals use pre-existing explicit knowledge and shape it with their own tacit knowledge.	Individuals are educated with a common understanding of social and environmental accounting so they can interpret SER using these concepts, but the individual shapes them with his/her own experiences of the world and ways of conduct.

Source: Adapted from Nonaka (1991, 1994) and Thomson and Bebbington (2004, 2005)

Table 2: Students' feedback on skills acquired

	Mean	Median	Mode	Standard Deviation	<i>n</i>
(I) CONTENT OF THE SUBJECT MATTER					
Social Issues	3.97	4	4	0.86	61
Environmental issues	4.20	4	5	0.89	61
Corporate Social Responsibility	3.95	4	4	0.83	61
Corporate Reporting	3.82	4	4	0.99	61
Social and Environmental Accounting	4.03	4	5	0.90	60
(II) ORGANISATION'S CORPORATE SOCIAL RESPONSIBILITY INITIATIVES					
University CSR	4.25	4	4	0.81	60
Other organisations' CSR	3.46	4	4	1.07	61
(III) GROUP WORK					
Organize in a group	4.18	4	5	0.83	61
Attend meetings	4.38	5	5	0.80	61
Team work and cooperation	4.35	5	5	0.80	60

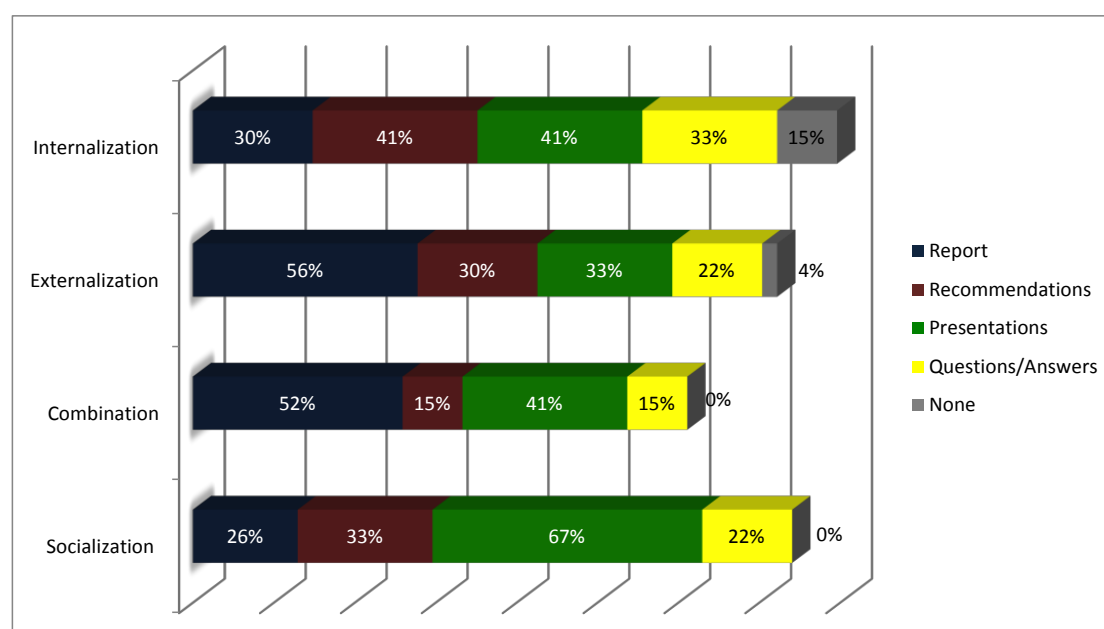
Work load distribution	4.11	4	4	0.91	61
Conflict resolution	3.80	4	3	1.01	60
Brainstorm	4.05	4	4	0.92	61
Work in collaboration	3.59	4	5	1.31	58
(IV) OTHER SKILLS					
Research skills	3.67	4	4	1.22	61
Writing skills	3.92	4	5	1.05	61
Think critically and creatively	3.70	4	4	0.92	61
Presentation skills	4.13	4	5	0.85	61
Discussion skills	4.07	4	4	0.87	61

Table 3: The parts of the project students perceived learning experience from engagement/discussion with others was facilitated

	Mean	Median	Mode	Standard Deviation	<i>n</i>
Report	3.76	4	3	0.89	21
Recommendations	3.24	3	4	1.04	21
Presentation	3.86	4	4	0.65	21
Questions/answers after presentation	3.24	4	4	1.26	21

Note: n represents the total of students that responded to this part of the questionnaire.

Graphic 1: Students' perception on different parts of the project



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¹ <https://peopleandplanet.org/university-league> and http://www.eauc.org.uk/universities_that_count_-_he_benchmarking_report

² Link to the report produced by the University of Plymouth (<http://www.plymouth.ac.uk/files/extranet/docs/WEB/CSR%20Report%20web%20final.pdf>). In addition, links to access to sustainability information provided online at the webpage for the University of Nottingham and the University of Northampton.